

### 2013 Energy Standards Nonresidential Indoor Lighting

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Efficiency Division

ICC San Joaquin Valley Chapter SCE Energy Education Center, Tulare June 30, 2015



#### Goals for this Presentation

- Simplify Energy Standards requirements for Nonresidential Lighting:
  - ➤ Indoor lighting
  - ➤ Lighting controls
  - > Acceptance testing



#### What does a Plans Examiner do?



- Verify lighting wattage meet Certificate of Compliance
  - $\triangleright$  i.e. LPDs (W/ft<sup>2</sup>)
- Verify mandatory measures are met
  - ➤ Lighting Controls
- Verify applicable
   Acceptance & Installation
   forms are specified





### Simplify Plan Review with Plans **Review Checklist**

- Plan Review Checklist by EnergyCodeAce
  - > Specifies which components to verify on plans and NRCC forms
  - ➤ <a href="http://energycodeace.com/conte">http://energycodeace.com/conte</a> nt/resources-checklists/

Resources Checklist	3: Lighting New Construction, Addition, and/Alteration 3 of 5 checklists to be completed 1: Overview & General Information, 2: Envelope, 3: Lighting 4: Mechanical, and 5: Process & Electrical					
NRCC-LTI-01 (Indoor) Are the following NRCC inputs confirmed on the plans?	Standards Section #	Project Notes (PE can use this section to record project data, as needed)	YES	NO*		
Building type		Nonresidential / High-rise residential / Hotel-motel gue Public school / Relocatable public school building	stroom			
Report type		Conditioned / Unconditioned / Both				
Construction type		New construction / Addition / Alteration				
Method of compliance		Complete building / Area category / Tailored				
Summary of allowed lighting power: Verify total installed watts						
Verify adjusted installed lighting power						
Verify allowed lighting power		See Section NRCC-LTI-03: Lighting Power Allowance below				
Adjusted installed lighting ≤allowed lighting power						
Required Certificates of Installation and Acceptance match scope of work						
Portable luminaires in offices: Verify installed lighting ≤allowed lighting power						
Verify light ffixtures EXEMPT from lighting power calculations	§140.6(a)3					
NRCC-LTI-02-E Lighting Controls		Carlo				
Space type being reported		Conditioned / Unconditioned				
Mandatory lighting controls scheduled match scope of project.						
Lighting schedule:  Type of lighting controls  Location of controls, number of luminaires per control,	§130.1					
and standard section with which controls comply Power adjustment factor (PAF) controls as allowed per table 140.6-A	§140.6(a)2					
NRCC-LTI-03: Lighting Power Allowa	ance					
Report type		Conditioned / Unconditioned				
Allowed building watts matches values on compliance document NRCC-LTI-01		Yes / No				
Complete Building Method Building type matches project and is listed in Table 140.6-B (90% of building occupancy)	Table 140.6-B					
Wattage allowance per building type, building area						

Fig. Energy Code Ace This program is funded by California utility customers under the auspices of the California

LIGHTING Page 1 of 3

Nonresidential Prescriptive Method



# Were all applicable NRCC forms Submitted? NRCC-LTI

- LTI-01: Indoor Lighting
- LTI-02: Lighting Controls
- LTI-03: Power Allowance
- LTI-04: Tailored Method
- LTI-05: Line voltage track lighting

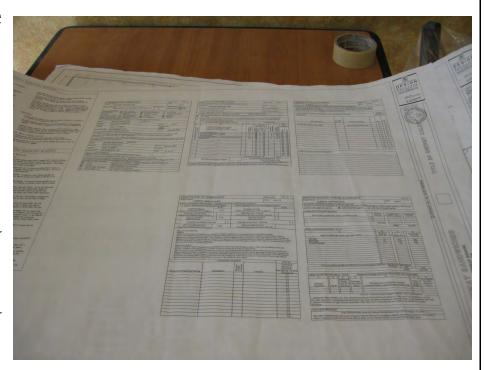


\* Forms should be incorporated onto plans



### §10-103 and the Plans Examiner

- Verify required
   Certificate of Compliance
   on plans
  - ➤ NRCC-LTI-01, 02 and 03 are required for all submittals
  - ➤ NRCC-LTI-04 only required for Tailored Method
  - ➤ NRCC-LTI-05 only required when track lighting is specified





### §140.6 and the Plans Examiner

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- Verify proposed watts/ft<sup>2</sup> on NRCC-LTI-01 form
  - ➤ Values should match lighting schedule on electrical plans
- Verify applicable Certificate
   of Acceptance and Installation
   forms specified on NRCC LTI-01



### Let's Discuss Mandatory Indoor Lighting Requirements



# Mandatory Indoor Lighting Requirements

#### • Mandatory req. include:

- Requirements for lighting control devices & systems (§110.9)
- Lighting Controls
- Acceptance Testing



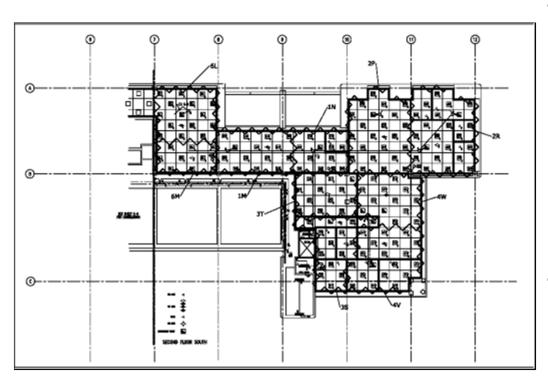
# Mandatory Indoor Lighting Controls

Section	Control Type
§130.1(a)	Area Controls
§130.1(b)	Multi-Level Lighting Controls
§130.1(c)	Shut-OFF Controls
§130.1(d)	Automatic Daylighting Controls
§130.1(e)	Demand Responsive Controls



### Area Controls

§130.1(a)



#### Does each space have manual ON/OFF control?

- Each space separately controlled
- Readily accessible
- Verify on electrical plans



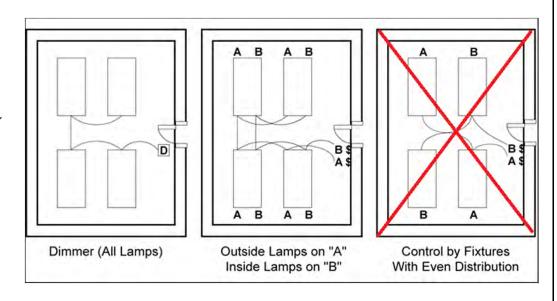
# Area Controls §130.1(a)

- General Lighting controlled separately from other lighting types:
  - ➤ Display
  - ➤ Ornamental
  - > Special effects
  - ➤ Display case



# Multi-Level Lighting Control §130.1(b)

- Do required spaces have multi-level controls?
  - ➤ General lighting only
  - $\geq$  100 ft<sup>2</sup>; and
  - $> 0.5 \text{ W/ft}^2$
- Verify on electrical plans:
  - ➤ Multi-level control meets TABLE 130.1-A





# Multi-Level Lighting Control §130.1(b)

- TABLE 130.1-A
- Most luminaire types require:
  - > Continuous dimming; or
  - > Step dimming; or
  - > Switching alternate lamps
- A/B or "checker board" switching not allowed

Line-voltage sockets except GU-24						
Low-voltage incandescent systems	Continuous dimming 10-100 percent					
LED luminaires and LED source systems						
GU-24 rated for LED						
GU-24 sockets rated for fluorescent > 20 watts			Continuous	0-100 percent		
Pin-based compact fluorescent > 20 watts <sup>2</sup>						
GU-24 sockets rated for fluorescent ≤ 20 watts				Stepped dimming; or		
Pin-based compact fluorescent ≤ 20 watts <sup>2</sup>	,	linimum one 30-70 p	step between	1	Continuous dimming; or	
Linear fluorescent and U-bent fluorescent ≤ 13 watts	35-76 Jenem			Switching alternate lamps in a luminaire		
	Min	imum one sto	p in each ran	Stepped dimming; or		
Linear fluorescent and U-bent fluorescent > 13 watts	20-40 %	50-70 %	80-85 %	100 %	Continuous dimming, or switching alternate lamps in each luminaire, having a minimum of 4 lamps per luminaire, illuminating the same area and in the same manner	
Track Lighting	Minimum one step between 30 – 70 percent			Step dimming; or Continuous dimming; or Separately switching circuits in multi-circuit track with a minimum of two circuits.		
HID > 20 watts					Stepped dimming; or	

Minimum one step between

Full rated input power of ballast and lamp, corresponding to maximum ballast factor
 Includes only pin based lamps: twin tube, multiple twin tube, and spiral lamps

ame area and in the same

TABLE 130.1-A MULTI-LEVEL LIGHTING CONTROLS AND UNIFORMITY REQUIREMENTS

Luminaire Type

ine-voltage sockets except GI1-24

Induction > 25 watts

Other light sources

Minimum Required Control Steps

( percent of full rated power1)

TABLE 130.1-A MULTI-LEVEL LIGHTING CONTROLS AND UNIFORMITY REQUIREMENTS						
Luminaire Type			red Control Il rated powe		Uniform level of illuminance shall be achieved by:	
Line-voltage sockets except GU-24						
Low-voltage incandescent systems	Continuous dimming 10-100 percent					
LED luminaires and LED source systems			Commuou	<i></i> 1	o roo percom	
GU-24 rated for LED						
GU-24 sockets rated for fluorescent > 20 watts			Continuor	ıs dimming 2	0-100 percent	
Pin-based compact fluorescent > 20 watts <sup>2</sup>			Commuo	5 =	- Too person	
GU-24 sockets rated for fluorescent ≤ 20 watts	=				Stepped dimming; or	
Pin-based compact fluorescent ≤ 20 watts <sup>2</sup>			e step betwee	en	Continuous dimming; or	
Linear fluorescent and U-bent fluorescent ≤ 13 watts	30-70 percent				Switching alternate lamps in a luminaire	
	Mi	nimum one s	tep in each ra	nge:	Stepped dimming; or	
	20-40 %	50-70 %			Continuous dimming; or	
Linear fluorescent and U-bent fluorescent > 13 watts			80-85 %	100 %	switching alternate lamps in each luminaire, having a minimum of 4 lamps per luminaire, illuminating the same area and in the same manner	
					Step dimming; or	
		Minimum on	e step betwee	en	Continuous dimming; or	
Track Lighting		30 – 70	) percent	Separately switching circuits in multi-circuit track with a minimum of two circuits.		
HID > 20 watts					Stepped dimming; or	
Induction > 25 watts					Continuous dimming; or	
Other light sources	Minimum one step between 50 - 70 percent				Switching alternate lamps in each luminaire, having a minimum of 2 lamps per luminaire, illuminating the same area and in the same manner.	

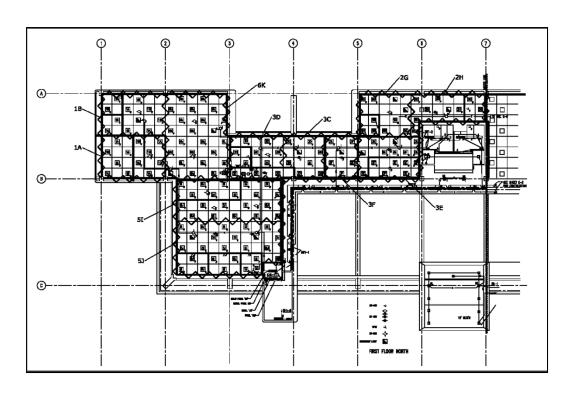
1. Full rated input power of ballast and lamp, corresponding to maximum ballast factor

2. Includes only pin based lamps: twin tube, multiple twin tube, and spiral lamps



#### **Shut-OFF Controls**

§130.1(c)



### Are shut-off controls specified?

- ➤ Occupant Sensing; or
- > Automatic time switch
  - Must have override control

### Verify on electrical plans



### Shut-OFF Controls §130.1(c)

- Some areas require occupancy sensors
- Areas where occupant sensing control are required to shut-off all lighting:
  - ➤ Offices 250 ft² or smaller
  - ➤ Multipurpose rooms less than 1,000 ft²
  - > Classrooms
  - > Conference rooms



#### Shut-OFF Controls §130.1(c)

- Areas where partial ON/OFF occupant sensing controls are required in addition to shut-off control:
  - ➤ Aisle ways and open areas in warehouses
  - Library book stack aisles
  - > Corridors and stairwells
- Reduce lighting by at least 50% when space is unoccupied
- Shut-off ALL lighting when space typically unoccupied



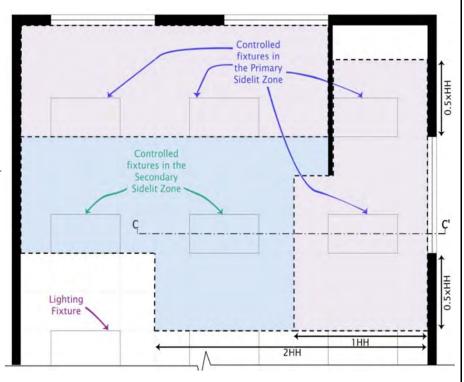
### Shut-OFF Controls §130.1(c)

- Areas where partial ON/OFF occupant sensing controls required instead of shut-off control:
  - > Stairwells and common area corridors
    - In hotels/motels, high rise res
  - Parking garages
  - ➤ Parking areas
  - ➤ Loading/unloading areas
- Lighting not required to be fully shut-off in these areas



# **Automatic Daylighting Controls** §130.1(d)

- Are daylight controls specified? Req. if:
  - $\geq$  120 watts of lighting within the daylit zone; and
  - $\geq$  24 ft<sup>2</sup> glazing area
- Daylit zones required to be shown on plans





### **Automatic Daylighting Controls** §130.1(d)

#### Automatic Daylight Controls:

- > Apply to general lighting only
- Lighting in daylit zones must be separately controlled
  - Skylit Daylit Zone
  - Primary Sidelit Daylit Zone
- ➤ Meet uniformity req. of TABLE 130.1-A



### **Automatic Daylighting Controls** §130.1(d)

- Are daylight controls specified in the Parking Garage?
  - $\geq$  60 watts of lighting in primary sidelit zone; and
  - $\geq$  36 ft<sup>2</sup> of glazing or opening
  - ➤ Automatic daylighting control can be multilevel, continuous dimming or ON/OFF



### **Demand Responsive Controls** §130.1(e)

- Are DR controls specified? Req. if:
  - ➤ Building is greater than 10,000 ft²
- DR control should be capable of reducing total lighting power by minimum 15%
  - > Spaces with LPD < 0.5 W/ft<sup>2</sup> do not count toward total lighting power
  - ➤ Non-habitable spaces cannot be used to satisfy this requirement
    - Closets, storage areas, etc.



# **Demand Responsive Controls** §130.1(e)

- Areas with LPD less than 0.5 W/ft<sup>2</sup> not counted toward 10,000 ft<sup>2</sup> trigger
  - ➤ Clarified in May-June Blueprint Newsletter

#### • Example:

- ➤ 15,000 ft<sup>2</sup> parking garage
- ➤ Parking Area LPD 0.14 W/ft²
- > 500 ft<sup>2</sup> elevator lobby with LPD of 0.6 W/ft<sup>2</sup>
  - Should Demand Response control be required in this space?



#### **Questions on Mandatory Req.?**





### Let's Discuss Prescriptive Indoor Lighting Requirements



# Prescriptive Indoor Lighting Requirements

#### • Prescriptive req. include:

- Calculation of indoor lighting power
- ➤ Power adjustment factors
- > Automatic daylight control in secondary daylit zones



#### Three methods for compliance:

- Complete building method (TABLE 140.6-B)
- ➤ Area category method (TABLE 140.6-C)
- Tailored method (TABLE 140.6-D through G)



#### Complete Building Method

- ➤ TABLE 140.6-B lists building types and corresponding LPD
- ➤ Single LPD for entire building

TABLE 140.6-B COMPLETE BUILDING METHOD LIGHTING POWER DENSITY VALUES

TYPE OF BUILDING	ALLOWED LIGHTING POWER DENSITY (WATTS PER SQUARE FOOT)
Auditorium Building	1.5
Classroom Building	1.1
Commercial and Industrial Storage Building	0.6
Convention Center Building	1.2
Financial Institution Building	1.1
General Commercial Building/Industrial Work Building	1.0
Grocery Store Building	1.5
Library Building	1.3
Medical Building/Clinic Building	1.1
Office Building	0.8
Parking Garage Building	0.2
Religious Facility Building	1.6
Restaurant Building	1.2
School Building	1.0
Theater Building	1.3
All others buildings	0.6

TABLE 140.6-B COMPLETE BUILDING METHOD LIGHTING POWER DENSITY VALUES

TYPE OF BUILDING	ALLOWED LIGHTING POWER DENSITY (WATTS PER SQUARE FOOT)			
Auditorium Building	1.5			
Classroom Building	1.1			
Commercial and Industrial Storage Building	0.6			
Convention Center Building	1.2			
Financial Institution Building	1.1			
General Commercial Building/Industrial Work Building	1.0			
Grocery Store Building	1.5			
Library Building	1.3			
Medical Building/Clinic Building	1.1			
Office Building	0.8			
Parking Garage Building	0.2			
Religious Facility Building	1.6			
Restaurant Building	1.2			
School Building	1.0			
Theater Building	1.3			
All others buildings	0.6			



#### Area Category Method

- ➤ TABLE 140.6-C lists function areas and corresponding LPD
- Each area calculated separately
- ➤ Sum allowed lighting power for all areas

TABLE 140.6-C AREA CATEGORY METHOD - LIGHTING POWER DENSITY VALUES (WATTS/FT²)

PRIMARY FUNCTION AREA		ALLOWED LIGHTING POWER (W/ft²)	PRIMARY FUNCTION AREA		ALLOWED LIGHTING POWER (W/ft²)	
Auditorium Area		1.5 3		Reading areas	1.2 3	
Auto Repair Are	ea	0.9 2	Library Area	Stack areas	1.5 3	
Beauty Salon A	rea	1.7	1-11-1-1	Hotel lobby	1.1 3	
Civic Meeting I	Place Area	1.3 3	Lobby Area	Main entry lobby	1.5 3	
Classroom, Lec Vocational Area		1.2 5	Locker/Dressing R	coom	0.8	
	d Industrial Storage ned and unconditioned)	0.6	Lounge Area		1.1 3	
Commercial and Areas (refrigera	d Industrial Storage ted)	0.7	Malls and Atria		1.2 3	
Convention, Co and Meeting Ce	nference, Multipurpose nter Areas	1.4 3	Medical and Clinical Care Area		1.2	
Corridor, Restro Areas	oom, Stair, and Support	0.6	Office Area	> 250 square feet	0.75	
Dining Area		1.1 3		≤250 square feet	1.0	
Electrical, Mecl Rooms	nanical, Telephone	0.7 2	L Control	Parking Area	0.14	
Exercise Center	, Gymnasium Areas	1.0	Parking Garage Area	Dedicated Ramps	0.3	
Exhibit, Museur	m Areas	2.0	- Alca	Daylight Adaptation Zones <sup>9</sup>	0.6	
Financial Trans	action Area	1.2 3	Religious Worship Area		1.5 3	
General Commercial	Low bay	0.9 2	Retail Merchandise Showroom Areas	e Sales, Wholesale	1.2 <sup>6 and 7</sup>	
and Industrial	High bay	1.0 2				
Work Areas	Precision	1.2 4	4000000	Motion picture	0.9 3	
Grocery Sales A	rea	1.2 6 and 7	Theater Area	Performance	1.4 3	

#### TABLE 140.6-C AREA CATEGORY METHOD - LIGHTING POWER DENSITY VALUES (WATTS/FT²)

PRIMARY FUNCTION AREA		ALLOWED LIGHTING POWER (W/ft²)	PRIMARY F	UNCTION AREA	ALLOWED LIGHTING POWER (W/ft²)	
Auditorium Area	l	1.5 3	Library Area	Reading areas	1.2 3	
Auto Repair Are	a	0.9 2		Stack areas	1.5 3	
Beauty Salon Ar	ea	1.7	Lobby Area	Hotel lobby	1.1 3	
Civic Meeting Pl	ace Area	1.3 3		Main entry lobby	1.5 3	
Classroom, Lector Vocational Areas		1.2 5	Locker/Dressing Ro	oom	0.8	
	Industrial Storage ed and unconditioned)	0.6	Lounge Area		1.1 3	
Commercial and Areas (refrigerate	Industrial Storage ed)	0.7	Malls and Atria		1.2 3	
Convention, Con and Meeting Cen	ference, Multipurpose iter Areas	1.4 3	Medical and Clinica	al Care Area	1.2	
Corridor, Restroo Areas	om, Stair, and Support	0.6	Office Area	> 250 square feet	0.75	
Dining Area		1.1 3		≤ 250 square feet	1.0	
Electrical, Mecha Rooms	anical, Telephone	0.7 2	Parking Garage Area	Parking Area	0.14	
Exercise Center,	Gymnasium Areas	1.0		Dedicated Ramps	0.3	
Exhibit, Museum	n Areas	2.0		Daylight Adaptation Zones 9	0.6	
Financial Transa	ction Area	1.2 3	Religious Worship	Area	1.5 3	
General Commercial	Low bay	0.9 2	Retail Merchandise Showroom Areas	Sales, Wholesale	1.2 <sup>6 and 7</sup>	
and Industrial Work Areas	High bay	1.0 2				
ii olk Alcas	Precision	1.2 4	Theater Area	Motion picture	0.9 3	
Grocery Sales Area		1.2 6 and 7		Performance	1.4 3	
Hotel Function A	Area	1.5 3	Transportation Fund	ction Area	1.2	
Kitchen, Food Pr	reparation Areas	1.6	Videoconferencing	Studio	1.2 8	
Laboratory Area	, Scientific	1.4 1	Waiting Area		1.1 3	
Laundry Area		0.9	All other areas		0.6	

Footnotes for this table are listed below.

#### FOOTNOTES FOR TABLE 140.6-C:

See Section 140.6(c)2 for an explanation of additional lighting power available for specialized task work, ornamental, precision, accent, display, decorative, and white boards and chalk boards, in accordance with the footnotes in this table. The smallest of the added lighting power listed in each footnote below, or the actual design wattage, may be added to the allowed lighting power only when using the Area Category Method of compliance.

Footnote number	Type of lighting system allowed	Maximum allowed added lighting power. (W/ft² of task area unless otherwise noted)
1	Specialized task work	0.2 W/ft <sup>2</sup>
2	Specialized task work	0.5 W/ft <sup>2</sup>
3	Ornamental lighting as defined in Section 100.1 and in accordance with Section 140.6.(c)2.	0.5 W/ft²
4	Precision commercial and industrial work	1.0 W/ft <sup>2</sup>
5	Per linear foot of white board or chalk board.	5.5 W per linear foot
6	Accent, display and feature lighting - luminaires shall be adjustable or directional	0.3 W/ft²
7	Decorative lighting - primary function shall be decorative and shall be in addition to general illumination.	0.2 W/ft <sup>2</sup>
8	Additional Videoconferencing Studio lighting complying with all of the requirements in Section 140.6(c)2Gvii.	1.5 W/ft <sup>2</sup>
9	Daylight Adaptation Zones shall be no longer than 66 feet from the entran	nce to the parking garage



#### Tailored Method:

- ➤ <u>TABLE 140.6-D</u> lists function areas and target illumination levels
- > Calculates general lighting power allowance
- > Provides additional allowance for specialized lighting
  - Wall display
  - Floor display
  - Ornamental

#### TABLE 140.6-D TAILORED METHOD LIGHTING POWER ALLOWANCES

1	2	3	4	5
Primary Function Area	General Illumination Level (Lux)	Wall Display Power (W/ft)	Allowed Combined Floor Display Power and Task Lighting Power (W/ft²)	Allowed Ornamental/ Special Effect Lighting
Auditorium Area	300	2.25	0.3	0.5
Civic Meeting Place	300	3.15	0.2	0.5
Convention, Conference, Multipurpose, and Meeting Center Areas	300	2.50	0.4	0.5
Dining Areas	200	1.50	0.6	0.5
Exhibit, Museum Areas	150	15.0	1.2	0.5
Financial Transaction Area	300	3.15	0.2	0.5
Grocery Store Area	500	8.00	0.9	0.5
Hotel Function Area	400	2.25	0.2	0.5
Lobby Area:				
Hotel lobby	200	3.15	0.2	0.5
Main entry lobby	200	0	0.2	0
Lounge Area	200	7.00	0	0.5
Malls and Atria	300	3.50	0.5	0.5
Religious Worship Area	300	1.50	0.5	0.5
Retail Merchandise Sales, and Showroom Areas	400	14.00	1.0	0.5
Theater Area:				
Motion picture	200	3.00	0	0.5
Performance	200	6.00	0	0.5
Transportation Function Area	300	3.15	0.3	0.5
Waiting Area	300	3.15	0.2	0.5



#### Tailored Method Calculation:

- ➤ LPD of the space dependent on Room Cavity Ratio and target illumination level
- Table 140.6-F, Room Cavity Ratio equations

$$RCR = \frac{5 \times H \times (L + W)}{L \times W} \qquad RCR = \frac{2.5 \times H \times P}{A}$$

➤ <u>Table 140.6-G</u>, Tailored Method LPDs



- Tailored & Area Category Method can be used together in a building. Each space must use one or the other.
  - Tailored method task lighting cannot be traded off, only general lighting
- If Complete Building Method is used, Tailored & Area Category cannot be used.



### Power Adjustment Factors (PAF) §140.6(a)2

#### Allows for reduction of lighting power

➤ Installing controls beyond mandatory req.

TABLE 140.6-A LIGHTING POWER DENSITY ADJUSTMENT FACTORS (PAF)

TYP	E OF CONTROL	TYP	E OF AREA	FACTOR
Section 140.6(a b. Only one PA	a)2 F may be used for each qualify	Factors in this table, the installation of the Factors in the Installation of the Instal		irements in
1. Partial-ON	N Occupant Sensing Control	Any area ≤ 250 square feet enc any size classroom, conference	losed by floor-to-ceiling partitions; or waiting room.	0.20
		In open plan offices > 250	No larger than 125 square feet	0.40
Occupant Sensing Controls in Large     Open Plan Offices		square feet: One sensor controlling an area that is:	From 126 to 250 square feet	0.30
			From 251 to 500 square feet	0.20
3. Dimming	Manual Dimming	Hotels/motels, restaurants, auditoriums, theaters		0.10
System	Multiscene Programmable			0.20
4. Demand Re	sponsive Control	All building types less than 10, Luminaires that qualify for othe for this demand responsive con	0.05	
	Manual Dimming plus Partial- ant Sensing Control	Any area ≤ 250 square feet enc any size classroom, conference	0.25	

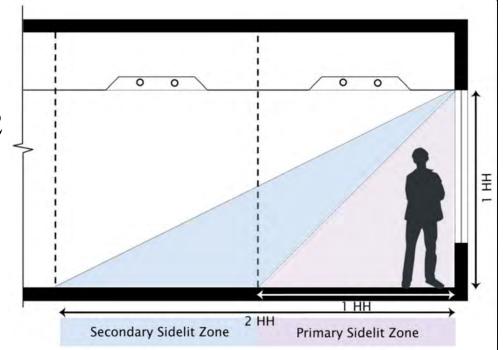
#### TABLE 140.6-A LIGHTING POWER DENSITY ADJUSTMENT FACTORS (PAF)

TYP	E OF CONTROL	ТҮРЕ	FACTOR			
<ul> <li>a. To qualify for any of the Power Adjustment Factors in this table, the installation shall comply with the applicable requirements in Section 140.6(a)2</li> <li>b. Only one PAF may be used for each qualifying luminaire unless combined below.</li> <li>c. Lighting controls that are required for compliance with Part 6 shall not be eligible for a PAF</li> </ul>						
1. Partial-ON	Occupant Sensing Control	Any area ≤ 250 square feet enclosed classroom, conference or waiting room	by floor-to-ceiling partitions; any size om.	0.20		
		feet: One sensor controlling an	No larger than 125 square feet	0.40		
2. Occupant Se	nsing Controls in Large Open Plan Offices		From 126 to 250 square feet	0.30		
	1 1411 0 111000		From 251 to 500 square feet	0.20		
3. Dimming	Manual Dimming	Hotels/motels, restaurants, auditoriums, theaters		0.10		
System	Multiscene Programmable	Hotels/motels, restaurants, auditoriu	ms, meaters	0.20		
4. Demand Respo	onsive Control	All building types less than 10,000 s Luminaires that qualify for other PA demand responsive control PAF	0.05			
5. Combined Mar Occupant Sen	nual Dimming plus Partial-ON sing Control	Any area $\leq$ 250 square feet enclosed by floor-to-ceiling partitions; any size classroom, conference or waiting room		0.25		



### Daylight Controls in Secondary Zones §140.6(d)

- Secondary Daylit Zones
  - ➤ Meet req. of §130.1(d)2
  - > Separately controlled
  - > Shown on the plans
- Daylight control in Secondary Daylit Zones can be traded off





### **Questions on Prescriptive Req.?**





# Let's Discuss Lighting Controls Acceptance Testing



- Acceptance Testing introduced in 2005
- 2013 Standards require certified Acceptance Test Technicians (ATTs)
- ATTs certified through CEC approved ATTCPs



- Two providers certified (as of 6/30/2015)
  - ➤ National Lighting Contractors Association of America (NLCAA)
  - California Advanced Lighting Controls Training Program (CALCTP)
- More information:
  - http://www.energy.ca.gov/title24/attcp/



- Acceptance testing always required when lighting controls are installed
  - ➤ New Construction
  - > Additions
  - > Alterations
- Acceptance testing required if building is under 10,000 ft<sup>2</sup>?
  - > YES



- Verify that applicable Certificate of Acceptance (NRCA) forms are specified/completed.
- Verify that ATT is certified by an approved provider:
  - > NLCAA
  - > CALCTP
- List of certified ATTs can be found on each providers respective websites



- CALCTP and NLCAA have each developed Certificate of Acceptance documentation.
- These "alternative" forms have been approved by the Executive Director of the Energy Commission
  - ➤ Will have CALCTP or NLCAA logo on the form
  - ➤ Will look similar to CEC form with the same content and informational order



#### Certificate of Acceptance Forms:

- ➤ NRCA-LTI-02 (Lighting Controls Acceptance)
- ➤ NRCA-LTI-03 (Automatic Daylight Controls)
- ➤ NRCA-LTI-04 (Demand Responsive Controls)
- ➤ NRCA-LTO-02 (Outdoor Lighting Controls)



### In Summary

- Acceptance testing is required for indoor/outdoor lighting controls
- When applicable, acceptance tests must be specified on the NRCC-LTI-01 form at permit
- Field technician must report results of acceptance testing on respective NRCA form at final inspection
- Field technicians performing testing for indoor/outdoor lighting must be a certified Acceptance Test Technician



# **Questions on Acceptance Testing?**





# Let's Discuss Lighting Alterations



### **Additions and Alterations**

- Additions
  - > same requirements as a newly constructed building
- Lighting alterations
  - > certain control requirements based on project scope
- Acceptance Testing required



### **Lighting Alterations**

- Three types of lighting alterations:
  - Lighting system alterations (§141.0(b)2Iii)
  - Luminaire modification-in-place (§141.0(b)2Iiii)
  - Lighting wiring alterations (§141.0(b)2Iiv)
- Let's discuss each type



- Lighting System Alterations:
  - Existing lighting system modified; or
  - > Luminaires replaced; or
  - Luminaires disconnected from the circuit, removed and reinstalled, whether in the same location or installed elsewhere (i.e. relocated)
- Only triggered if new luminaires are added or existing luminaires are altered.



- Lighting system alterations meet req. in TABLE 141.0-E
- Four Scenarios:
  - > < 10% luminaires affected
  - $\geq$  10% luminaires affected, and LPD  $\leq$  85% of allowed
  - $\geq$  10% luminaires affected, and LPD > 85% of allowed
  - > Change in area, space type, increase in LPD

LPD stands for Lighting Power Density (Watts/ft²)



- < 10% of luminaires affected in enclosed space
  - ➤ No Requirement
  - > Allows for repairs without triggering code.
- Let's look at TABLE 141.0-E



TABLE 141.0-E Requirements for Luminaire Alterations

Quantity of existing affected luminaires per Enclosed Space <sup>1</sup>	Resulting Lighting Power for Each Enclosed Space	Applicable Mandatory Control Provisions for Each Enclosed Space	Multi-level Lighting Control Requirements for Each Altered Luminaire
	Alterations that do not change	the area of the enclosed space or th	e space type
Sum total < 10% of existing luminaires	Existing lighting power is permitted	Existing provisions are permitted	Existing controls are permitted
Sum total $\geq 10\%$ of	≤85% of allowed lighting power per Section 140.6 Area Category Method	§130.1(a), (c)	Two level lighting control <sup>2</sup> or §130.1(b)
existing luminaires	> 85% of allowed lighting power per Section 140.6 Area Category Method	§130.1(a), (c), (d) <sup>3</sup>	§130.1(b)
Alterations that ch	nange the area of the enclosed space	or the space type or increase the li	ghting power in the enclosed space
Any number	Comply with Section 140.6	§130.0(d) <sup>3</sup> §130.1(a), (c), (d) <sup>3</sup> , (e)	§130.1(b)

- 1. Affected luminaires include any luminaire that is changed, replaced, removed, relocated; or, connected to, altered or revised wiring, except as permitted by EXCEPTIONS 1 and 2 to Section 141.0(b)21ii:
- 2. Two level lighting control shall have at least one control step between 30 percent and 70 percent of design lighting power in a manner providing reasonably uniform illuminations
- 3. Daylight controls in accordance with Section 130.0(d) are required only for luminaires that are altered.



- ≥ 10% of luminaires affected in the enclosed space. Req. controls (depending on LPD):
  - > Area controls

Daylight Control\*

- Shutoff controls
- ➤ Multi-level control\*

\*Multi-level and Daylight control apply to altered luminaires only



TABLE 141.0-E Requirements for Luminaire Alterations

Quantity of existing affected luminaires per Enclosed Space 1	Resulting Lighting Power for Each Enclosed Space	Applicable Mandatory Control Provisions for Each Enclosed Space	Multi-level Lighting Control Requirements for Each Altered Luminaire
	Alterations that do not change	the area of the enclosed space or th	e space type
Sum total < 10% of existing luminaires	Existing lighting power is permitted	Existing provisions are permitted	Existing controls are permitted
Sum total $\geq 10\%$ of	≤ 85% of allowed lighting power per Section 140.6 Area Category total > 10% of Method §13		Two level lighting control <sup>2</sup> or §130.1(b)
existing luminaires	> 85% of allowed lighting power per Section 140.6 Area Category Method	§130.1(a), (c), (d) <sup>3</sup>	§130.1(b)
Alterations that cl	nange the area of the enclosed space	or the space type or increase the li	ghting power in the enclosed space
Any number	Comply with Section 140.6	\$130.0(d) <sup>3</sup> \$130.1(a), (c), (d) <sup>3</sup> , (e)	§130.1(b)

- 1. Affected luminaires include any luminaire that is changed, replaced, removed, relocated; or, connected to, altered or revised wiring, except as permitted by EXCEPTIONS 1 and 2 to Section 141.0(b)2Iii:
- 2. Two level lighting control shall have at least one control step between 30 percent and 70 percent of design lighting power in a manner providing reasonably uniform illuminations
- 3. Daylight controls in accordance with Section 130.0(d) are required only for luminaires that are altered.



- Alterations that change area of enclosed space, change space type, or increase lighting power, and that alter luminaires
  - Area controls
  - Shutoff controls
  - Multi-level control\*

- Daylight Control\*
- Demand Response Control

DR control required only if altered area is greater than 10,000 ft<sup>2</sup>

<sup>\*</sup>Multi-level and Daylight control applies to the altered luminaires only



- Luminaire Modifications-in-Place (LMIP):
  - Replacing both lamps and ballasts
  - ➤ Modifying internals of the luminaire
  - ➤ Changing optical system
  - ➤ One for one replacement of luminaires
- LMIP shall not be part of general remodeling or renovation, or changes to wiring to the lighting system.



#### • LMIP triggered in the enclosed space only if:

- $\geq$  40 luminaires in a building space are MIP; and
- $\geq$  10% of the luminaires in the enclosed space

TABLE 5- 13 Thresholds for Luminaire-Modifications-in-Place requirements

Number of Luminaire-Mo	Is compliance required for that		
Per annum per building space	In an enclosed space	enclosed space?	
< 40 in number	< 10%	No	
< 40 in number	≥ 10%	No	
≥ 40 in number	< 10%	No	
≥ 40 in number	≥ 10%	Yes	



- LMIP meet req. of TABLE 141.0-F
- Req. controls (depending on LPD):
  - > Area controls

Daylight Control\*

- > Shutoff controls
- ➤ Multi-level control\*
- Let's look at TABLE 141.0-F

\*Multi-level and Daylight control applies to the altered luminaires only



#### TABLE 141.0-F-Requirements for Luminaire Modifications-in-Place

For compliance with this Table, building space is defined as any of the following:

- 1. A complete single story building
- 2. A complete floor of a multifloor building
- 3. The entire space in a building of a single tenant under a single lease
- 4. All of the common, not leasable space in single building

Quantity of affected luminaires per Building Space per annum	Resulting Lighting Power per Each Enclosed Space Where ≥ 10% of Existing Luminaires are Luminaire Modifications-in- Place	Applicable mandatory control provisions for each enclosed space <sup>1</sup>	Applicable multi-level lighting control requirements for each modified luminaire <sup>2</sup>	
Sum total < 40 Luminaire Modifications-in-Place	Existing lighting power is permitted	Existing provisions are permitted	Existing controls are permitted	
Sum total ≥ 40 Luminaire	≤ 85% of allowed lighting power per Section 140.6 Area Category Method	§130.1(a), (c)	Two level lighting control <sup>3</sup> Or §130.1(b)	
Modifications-in-Place	> 85% of allowed lighting power per Section 140.6 Area Category Method	§130.0(d) <sup>4</sup> §130.1(a), (c), (d) <sup>4</sup>	§130.1(b)	



# Lighting Wiring Alteration §141.0(b)2Iiv

#### • Lighting Wiring Alterations:

- ➤ Adding a circuit feeding luminaires
- ➤ Modifying/relocating wiring to luminaires
- ➤ Replacing wiring between switch or panelboard and luminaires
- ➤ Replacing or installing new panelboard feeding lighting systems
- Must meet *applicable* requirements of §110.9, §130.1, and §130.4



# **Questions on Lighting Alterations?**





### What does a Field Inspector do?



- Verify installed lighting power meets the Certificate of Compliance
- Verify mandatory lighting controls are installed
- Verify applicable
   Acceptance & Installation
   Forms are completed



### Simplify Inspections with Inspection

**Checklist** 

- Inspection Checklist by EnergyCodeAce
  - ➤ Used with the Plans Review checklist
  - Specifies which forms to verify
  - ➤ Electronic PDF to be completed in the field
  - http://energycodeace.com/content/resources-checklists/

Ace Resources Energy	Inspector Inspection	Chec	klist			Energy Code Ace Helping you play your cards eight
Project Address:						resping you pary your corts again
PROJECT CONTACTS						
Permit Applicant:			Pi	none:		
General Contractor:			PI	none:		
Plans Examiner:			PI	none:		
HERS Rater:			PI	none:		
HERS Provider:			Н	ERS Re	egistration Number:	
OVERALL REQUIREMENTS						YES NO
Is Plan Examiner's checklist available?						
All compliance documents completed, signed an	d registered with	nonresio	dential regis	stry (wh	en required):	
NRCC (Certificate of Compliance — most curre						
NRCI (Certificates of Installation)						
NRCA (Certificates of Acceptance)						
NRCV (Certificates of Verification - HERS) regi	stered with a HE	RS provi	der			
Building front orientation matches site plan						
Floor area (ft²) of conditioned versus uncondition	ed spaces match	hes appro	oved plans	et		
Fuel type used for HVAC systems matches NRC	C utility type					
INSPECTIONS Do installed measu	ires match N	RCC ar	nd meet a	all mai	ndatory requirem	ents?
		guired I			1000	1000
Measure	Form Name	NRCI	NRCA	NRCV	Notes	YES NO
SOLAR READY (NRCC-SRA)						760
Confirm path taken (A, B, C, D or E)	SPV-01				l -	
Minimum solar area provided	Strot					
ENVELOPE (NRCC-ENV AND/OR NRC	CC-PRF)					1.1
Exterior and demising wall construction details (i.e., cavity and continuous insulation)						
Roof construction details	1					
Cool roof: CRRC label verified	1					
Floor construction details	1					
Air barrier (per Table 3-18)						
Fenestration, by type:	ENV-01					
Area at each orientation <nrcc< td=""><td></td><td></td><td></td><td></td><td></td><td></td></nrcc<>						
U-factor(NFRC,sitebuilt,default)						
SHGC(NFRC, sitebuilt, default)				_		
SHGC(NFRC,sitebuilt,default) Visual transmittance (VT)						



### §140.6 and the Field Inspector

#### At Rough Frame verify

- ➤ Installed watts/ft²
- ➤ Shall not exceed values on NRCC-LTI-01 form

### • If PAF controls credits were used

- Verify controls are installed
- ➤ Simplify with NRCI-LTI-05





# §140.6 and the Field Inspector *cont*.

- All req. NRCI-LTI forms must be verified
  - ➤ Refer to NRCC-LTI-01 (use as checklist)
  - Completed by installing contractor
- All req. NRCA-LTI forms must be verified
  - ➤ Refer to NRCC-LTI-01 (use as checklist)
  - ➤ Must be performed by Certified ATT

#### STATE OF CALIFORNIA

INDOOR LIGHTING
CEC-NRCC-LTI-01-E (Revised 06/13)

1	23
CALIFORNIA ENERGY COMMISSION	

ele integ lit et l'itemed de le	ONE OTTEN CENTER OF COMMISSION
CERTIFICATE OF COMPLIANCE – USER INSTRUCTIONS	NRCC-LTI-U1-E
Indoor Lighting	(Page 2 of 5)
Project Name: 2013 CALBO Training Sample	Date Prepared: <b>01/01/14</b>

5.	Complies ONLY if Installed ≤ Allowed		Complies ONLY if Installed	≤ Allowed	<b>‡</b>
6.	Allowed Lighting Power Conditioned NRCC-LTI-03-E, page 1		Allowed Lighting Power Unconditioned NRCC-LTI-03-E, page 1		

Declaratio	n of Requi	ired Installation Certificates – Declare by selecting yes for all Installation Certificates that will be submitted. (Retain copies	s and verify forms are						
completed	completed and signed.)								
YES	NO	Form/Title							
X		NRCI-LTI-01-E - Must be submitted for all buildings	☐ Field Inspector						
	X	NRCI-LTI-02-E - Must be submitted for a lighting control system, or for an Energy Management Control System (EMCS),	☐ Field Inspector						
		to be recognized for compliance.							
X		NRCI-LTI-03-E - Must be submitted for a line-voltage track lighting integral current limiter, or for a supplementary	☐ Field Inspector						
		overcurrent protection panel used to energize only line-voltage track lighting, to be recognized for compliance.							
	X	NRCI-LTI-04-E - Must be submitted for two interlocked systems serving an auditorium, a convention center, a	☐ Field Inspector						
		conference room, a multipurpose room, or a theater to be recognized for compliance.							
X		NRCI-LTI-05-E - Must be submitted for a Power Adjustment Factor (PAF) to be recognized for compliance.	☐ Field Inspector						
	X	NRCI-LTI-06-E - Must be submitted for additional wattage installed in a video conferencing studio to be recognized for	☐ Field Inspector						
		compliance.							

Declaration	<b>Declaration of Required Certificates of Acceptance</b> – Declare by checking all of the Certificates of Acceptance that will be submitted. (Retain copies and verify forms are						
completed	completed and signed.)						
YES	YES NO Form/Title						
X		NRCA-LTI-02-E - Must be submitted for occupancy sensors and automatic time switch controls.	☐ Field Inspector				
X	NRCA-LTI-03-E - Must be submitted for automatic daylight controls. ☐ Field Inspector						
	X	NRCA-LTI-04-E - Must be submitted for demand responsive lighting controls.	☐ Field Inspector				



### **Certificate of Installation**

- Completed by the installing contractor for:
  - > EMCS or lighting control system (NRCI-LTI-02)
  - ➤ Track lighting current limiter or supplementary overcurrent protection panel (NRCI-LTI-03)
  - > Two interlocked lighting systems (NRCI-LTI-04)
  - ➤ Power Adjustment Factors (NRCI-LTI-05)
  - ➤ Videoconference studio lighting (NRCI-LTI-06)



### **Final - Indoor Lighting**

#### Controls

Verify (each enclosed area):

#### Area controls

➤ ON/OFF controls

#### **Shut-off controls**

Occupancy sensor, automatic time switch

#### **Multi-level controls**

➤ Dimming, Dimming Uniformity

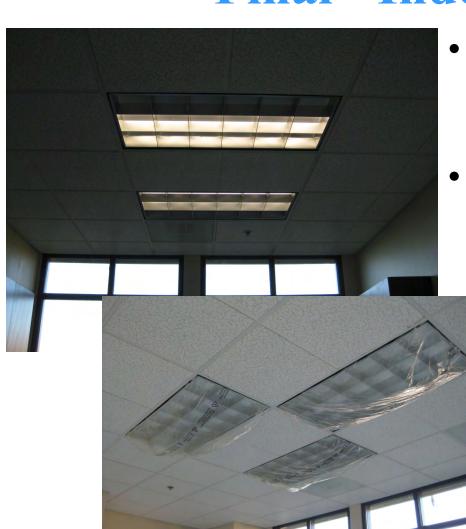
#### NRCA-LTI-02 form

➤ Acceptance test to verify lighting controls (simplify with this form)





### Final - Indoor Lighting cont.



#### Daylighting controls

Dimming, photo sensor, etc. (separate from general lighting)

#### Demand Response Controls

- Reduction of lighting power by 15%
- $\triangleright$  Req. when greater than 10,000 ft<sup>2</sup>

#### NRCA-LTI-03 & 04

➤ Acceptance test to verify daylighting & DR controls (simplify with these forms)



# §10-103 and the Field Inspector

		NRCI-LTI-
Energy Management Control System or Lighting C System	ontrol	(Page 5
Project News 2013 CALBO Training Sample	Informent Agency: Local Jurisdiction	Perris Humber: 010114
Project Address 2013 CALBO Drive	Chy: Eboramento	2) Order 96814
G. To qualify for the PAF for a Partial-ON Oc H. To qualify for the PAF for an occupant se areas above workstations, in accordance wit L. To qualify for the PAF for a Manual Dimm TABLE 140.6-A J. To qualify for the PAF for a Demand Resp K. To qualify for the PAF for Combined Man	nsing control controlling the general lig th TABLE 140.6-A ting System PAF or a Multiscene Progra Ionsive Control in TABLE 140.6-A	hting in large open plan office mmable Dimming System PAI
DOCUMENTATION ANTHOR'S DECLARATION STATEME 1. Locality that this Certificate of Installation docume		
Country that this Certificate of Installation docume  Documentation Author Name:	Documentation Author Standare:	
Best Doc. Author	Best Doc Author	
Documentation Author Company Name: Energy Savers Inc.	Date Signed: 1/1/2014	
Address: 1516 9° Street	CEA/ HERS Certification Identification	o ((Cappillable):
City/State/Zie:	N/A Phore:	
Sacramento, CA 95814  ASSPONSIBLE PERSON'S DECLARATION STATEMENT  I certify the following under penalty of perjury, un	(516) 362-4719 der the laws of the State of California:	
Sacramento, CA 95814  Inception to Figure 1 to the control of the	la16) 362-4719  der the laws of the State of California:  tallation is true and correct.  Tallation is true and correct.  The components, or manufacture  acts to the declaration in this statement  or exponsible builder/installer.  The components or manufactured devices (the in  or exponsible builder/installer.  The components or manufactured devices (the in  exposure of the order of the content  paper with the content  paper  p	red devices for the scope of work approache builder/installer], stallation] identified on this a conforma to the requirements sidentifies the specific requirement have ensured that the requirement have ensured that the requirement and exhaustic with the building able inspections. I understand the
Ascamento, CA 35814  MENDONISHE PRISON'S DECLARATION STATEMENT  I can't we following under penalty of perjury, un  I can't we following under penalty of perjury, un  I meligible under Ovision 3 of the Business and system design, construction, or installation of fast identified on this Cartificate of installation of fast identified on this Cartificate of installation of fast identified on this Cartificate of installation conforms to all applicable given on the plans and specification approved by  I reviewed a copy of the Cartificate of Compliance for the scape of construction or installation have to the conformation of	der the laws of the State of California: tallation is true and correct. The California is true and correct. The California is the applicable classificatures, matérials, components, or manufacture set to the declaration in this statemost or responsible builder/installer, or responsible builder/installer, or exponsible builder/installer, or exponsible builder/installer, or exponsible builder/installer, or exponsible builder/installer, approved by the enforcement agency that approved by the enforcement agency for all application the continuous of installation shall be posted, or certificate or	red devices for the scope of work approache builder/installer], stallation] identified on this a conforma to the requirements sidentifies the specific requirement have ensured that the requirement have ensured that the requirement and exhaustic with the building able inspections. I understand the
Ascaramento, CA 35814  **EXEQUATION STATEMENT*  I certify the following under penalty of perjury, un  The information provided to this Certificate of Inc 2  I am eligible under Division of John the Business and of system design, construction, or installation of feat identified on this Certificate of Installation of Sets identified on this Certificate of Installation of Sets identified on this Certificate of Installation conforms to all applicable given on the plans and specifications approved by  I. The constructed or installation statutes, materials, co-  Certificate of Installation conforms to all applicable given on the plans and specifications approved by  I. I reviewed a copy of the Certificate of Compliance for the scope of construction or installation have by  I. will ensure that a completed ingrined copy of this permitty) issued for the building, and made available completed gipned copy of the Certificate of Installation indicates the building sowner at accoupancy.  **W. Lighting Contractador**  Corsean, entelling lidecontator or beamed Contractors or beamed Contractors.	(216) 362-4719  der the laws of the State of California:  tallation is true and correct.  Translation is true and correct.  The Components of the applicable classificatures, materials, components, or manufacture  or exponsible builder/installer.  The responsible builder/installer  or exponsible builder/installer  approved by the enforcement agency that  been miss.  The enforcement agency for all applic  the other enforcement agency for all  application in required to be included with the de   Beconstitute Builder/weell* Expense.   36. Egifding Construction  Position With Company (Tissi)	red devices for the scope of work approache builder/installer], stallation] identified on this a conforma to the requirements sidentifies the specific requirement have ensured that the requirement have ensured that the requirement and exhaustic with the building able inspections. I understand the
ABAGEMENDO, CA 95814  MEDOMORISE PESSON'S DECLARATION STATEMENT  Locitify the following under penalty of perjuny, un  The information provided on this Certificate of Inc.  2. Immeligible under Division of a fit the Business and system design, construction, or installation of feat identified on this Certificate of the Business and of system design, construction, or installation on feat identified on this Certificate of Installation of Seat identified on this Certificate of Installation conforms to all applicable given on the plans and specification supposed by  4. I recieved a copy of the Certificate of Compliance for the scope of construction or installation have 5. I will ensure that a completed ingred copy of this permit(s) issued for the building, and made availal completed gined copy of the Certificate of Install the Building conver at accupancy.  Regulation of the Certificate of Company Resumpliance Repossible State Number News  Mr. Lighting Contractor Company Name; Installation State or Seater Confessor or Builder Deward  Company Name; Installation State or Seater Confessor or Builder Deward  Company Name; Installation State or Seater Confessor or Builder Deward  Company Name; Installation State or Seater Confessor or Builder Deward  Company Name; Installation State or Seater Confessor or Builder Deward  Company Name; Installation State or Seater Confessor or Builder Deward  Company Name; Installation State or Seater Confessor or  Builder Deward  Company Name; Installation State or Seater Confessor or  Builder Deward  Company Name; Installation State  Company Name; Installation State  Company Name; Installation State  Company Name; Installation  Company  Company  Company  Com	la16) 362-4719  der the laws of the State of Culffornia: Italiation is true and correct. Italiation is true and correct. The conference of the applicable classificatures, materials, components, or manufactures to the declaration in this statemost in the declaration in this statemost on the conference of the codes and regulations, and the installation opponents or manufactured devices (the inc codes and regulations, and the installation and the enforcement agency, approved by the enforcement agency that find on this Certificate of Installation, and II been met.  Certificate of Installation shall be posted, or bits to the enforcement agency for all application is required to be included with the description of the components studies/Installation is required to be included with the declaration in the components studies/Installation State (Installation Communication).  Becommiss studies/Installation State (Installation).  Denore	red devices for the scope of work approache builder/installer], stallation] identified on this a conforma to the requirements sidentifies the specific requirement have ensured that the requirement have ensured that the requirement and exhaustic with the building able inspections. I understand the
Ascaramento, CA 35814  **EXEQUATION STATEMENT*  I certify the following under penalty of perjury, un  The information provided to this Certificate of Inc 2  I am eligible under Division of John the Business and of system design, construction, or installation of feat identified on this Certificate of Installation of Sets identified on this Certificate of Installation of Sets identified on this Certificate of Installation conforms to all applicable given on the plans and specifications approved by  I. The constructed or installation statutes, materials, co-  Certificate of Installation conforms to all applicable given on the plans and specifications approved by  I. I reviewed a copy of the Certificate of Compliance for the scope of construction or installation have by  I. will ensure that a completed ingrined copy of this permitty) issued for the building, and made available completed gipned copy of the Certificate of Installation indicates the building sowner at accoupancy.  **W. Lighting Contractador**  Corsean, entelling lidecontator or beamed Contractors or beamed Contractors.	(216) 362-4719  der the laws of the State of California:  tallation is true and correct.  Translation is true and correct.  The Components of the applicable classificatures, materials, components, or manufacture  or exponsible builder/installer.  The responsible builder/installer  or exponsible builder/installer  approved by the enforcement agency that  been miss.  The enforcement agency for all applic  the other enforcement agency for all  application in required to be included with the de   Beconstitute Builder/weell* Expense.   36. Egifding Construction  Position With Company (Tissi)	red devices for the scope of work approache builder/installer], stallation] identified on this a conforma to the requirements sidentifies the specific requirement have ensured that the requirement have ensured that the requirement and exhaustic with the building able inspections. I understand the

- At Final, verify signature on Certificate of:
  - ➤ Installation (NRCI)
  - ➤ Acceptance (NRCA)
- Verify NRCA-LTI forms are signed by Certified Acceptance Test Technician



### **QUESTIONS...**





### Resources - Blueprint

- Published every other month
- Clarifications on frequently asked questions
- Receive by e-mail
- http://www.energy.ca.gov/ efficiency/blueprint/



#### In This Issue

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#### Cool Roofs & Condensation

A cool roof is a roofing material with high thermal emittance and high solar reflectance, or low thermal emittance and exceptionally high solar reflectance that reduces heat gain through the roof. Because cool roofs gain and retain less heat than traditional roofs, less heat is transferred through the envelope into

the building's interior. By lowering internal temperatures, cool roofs reduce occupant demand for air conditioning, allowing for building cooling cost savings.

The temperature of the cool roof is reduced to such an extent that moisture no longer evaporates as it would with a traditional roof. When cool roofs are not installed properly, moisture condenses and becomes trapped within the roofing materials. The trapped moisture can lead to mold growth and damage to the roofing materials or supporting elements.

To prevent the trapping of moist air, it is essential to follow proper air sealing procedures as outlined in Section 110.7 of the 2013 Building Energy Efficiency Standards (Energy Standards). Proper installation may require the installation of: air barriers, vapor barriers, insulation above the roof deck, and additional ventilation.

For more information on cool roofs, please review the U.S. Department of Energy's Energy Saver article "Cool Roofs" at: http://www.energy.gov/energysaver/articles/cool-roofs.

#### Quality Insulation Installation (QII) Compliance Credit for Insulated Headers

The 2013 Energy Standards provide Quality Insulation Installation (QII) compliance credit for R-2 insulated headers as indicated in Section RA3.5.6.2.9 of the 2013 Reference Residential Appendices (RA). Insulation or wood must fill the cavities, leaving no air gaps in or around the header. To obtain QII credit, use compliance document CF2R-ENV-21-H. Compliance with the R-2 insulated header requirement is verified in Section C. number 13 of this compliance document.

Three options meet the R-2 insulated header requirement:

1. Two-member header with insulation in between. The header and insulation must fill the wall cavity. Example: a 2x4 wall with two 2x nominal headers, or a 2x6 wall with a 4x nominal header-Insulation is required to fill the wall cavity and must be installed between the headers.



### **Resources - Fact Sheets**



CALIFORNIA ENERGY COMMISSION

Envelope Air Sealing 2013 California Energy Efficiency Building Standards

#### What is envelope air sealing?

Envelope air sealing is the process of limiting infiltration and exfiltration of air through the building envelope, the interface between the interior of the building and the outdoor environment. This process includes caulking, gasketing, weatherstripping, or otherwise sealing all joints, penetrations and other openings to limit air leakage.

#### When is envelope air sealing required?

Envelope air sealing is required when constructing, adding to, or altering residential and nonresidential buildings.

#### Why air seal the building envelope?

Air sealing of the building envelope is required by <u>Section 110.7</u> of the 2013 Building Energy Efficiency Standards (Energy Standards) and has been required since 1982. Buildings with improperly sealed envelopes experience higher rates of air leakage, which can result in increased energy use to heat or cool the building. This in-turn can lead to increased energy bills.

#### What are some of examples of what must be sealed?

- Exterior joints around window and door frames, including doors between the house and garage, between interior HVAC closets and conditioned space, between attic accesses and conditioned space, between wall sole plates and the exterior floor panels:
- · Exterior wall air barrier at the top and bottom plates;
- · Openings for plumbing, electricity, and gas lines in exterior walls, ceilings and floors;
- Openings in the attic floor, including where ceiling panels meet interior and exterior walls and masonry fireplaces;
- Openings around exhaust ducts such as those for clothes dryers;
   Field (hydrotted controller windows and
- Field-fabricated operable windows and doors must have weatherstripping, and
- All other such openings in the building envelope

Please see Figure 1<sup>a</sup> for common air leakage paths.

#### When is a compliance document required?

A CF2R-ENV-02-E compliance document is required when a residential building envelope is constructed, added to, or altered.

AN NRCI-ENV-01-E compliance document is

An NRCI-ENV-01-E compliance document is required when a non-residential building envelope is constructed, added to, or altered.



Figure 1 - Location of Common Air Leakage Paths

- 5 published to date
- Detailed clarifications on specific topic/requirements
- Receive by e-mail (listserver)
- http://www.energy.ca.gov/ efficiency/factsheets/



### Resources - Training

- Provided by Utilities
- Free of charge
- Can request for training in your region/area
- CEC training
- http://www.energy.ca.g
   ov/title24/training/





### Resources - Energy Code Ace



- Forms tools
- Free training (in person and online)
- Checklists, Trigger
   Sheets for building dept.
- http://www.energycodea
   ce.com/content/home/



### **Resources - Hotline**

- Toll-free in California
- Open Monday through Friday
  - > 8:00 am to noon, and 1:00 pm to 4:30 pm
- Call at:
  - > 1-800-772-3300 (In CA)
  - > (916) 654-5106 (Outside CA)
- OR, e-mail at: <u>Title24@energy.ca.gov</u>



### Resources - Listservers

- Main conduit for communicating with stakeholders
- Sign up at:
  - http://www.energy.ca.gov/listservers/
- Subscribe to the following Efficiency Lists:
  - Building Standards
  - > Blueprint
  - > Efficiency
- Respond to confirmation e-mail within 48 hours